GLASS BEADS FOR APPLICATION ON PAVEMENT MARKING MATERIAL MGS 91-07H

1.0 DESCRIPTION. These specifications cover Type I free flow and Type I moisture resistant glass beads for drop-on application on traffic marking material for the production of a reflective surface to improve the night visibility. The beads shall be highly resistant to traffic wear and to the effects of weathering.

1.1 Unless otherwise specified, references to a national standard agency specification (AASHTO, ASTM, etc.) are the latest revision in effect at the time of the contract letting.

2.0 MATERIALS. The beads shall meet the following requirements.

2.1 Flow Properties. The beads shall flow properly when tested in accordance with AASHTO M 247, for the kind of bead specified.

2.2 Refractive Index. The beads shall have a minimum refractive index of 1.50 when tested in accordance with AASHTO M 247.

2.3 Roundness. The beads shall have a minimum of 70 percent true spheres when tested in accordance with ASTM D 1155.

2.4 Gradation. The beads shall meet the following gradation requirements when tested in accordance with ASTM D 1214.

U. S. Standard Sieve No.	Percent Passing
20	100
30	75-95
50	15-35
- 100	0-5

2.5 Silica Content. The beads shall be made of glass containing not less than 58.0 percent Silica (SiO_2) when tested in accordance with ASTM C 169, Procedures for Referee Analysis.

2.6 Water Resistance. The beads shall show no readily discernible dulling and the amount of 0.1 Normal Hydrochloric Acid needed to titrate the filtrate shall not exceed 4.5 milliliters, when tested in accordance with this specification.

2.7 Calcium Chloride Resistance. The beads shall show no readily discernible dulling when tested in accordance this specification.

2.8 Sodium Sulfide Resistance. The beads shall show no readily discernible darkening or dulling when tested in accordance with this specification.

3.0 TEST METHODS.

3.1 Water Resistance. Ten ± 0.5 grams of beads placed in a Whatman single thickness cellulose extraction thimble, 33 by 80 millimeters, are refluxed for one hour in a Soxhlet extractor having an 85 millimeter siphon capacity using 150 milliliters of distilled water. All connections shall be ground glass. At the end of the refluxing period, allow the filtrate to cool to room temperature, and titrate with 0.1 normal hydrochloric acid, using phenolphthalein indicator. The beads shall be dried at 100 C, and examined for dulling under 60 power magnification.

3.2 Calcium Chloride Resistance. Immerse approximately 10 grams of the beads in a 1.0 Molar calcium chloride solution for 3 hours. Rinse well, by decantation, with distilled water. Spread beads on a clean filter paper and allow to dry. Examine the beads for dulling under 60 power magnification.

3.3 Sodium Sulfide Resistance. Immerse approximately 10 grams of the beads in a 50 percent solution of sodium sulfide for one hour. Rinse well, by decantation, with distilled water. Spread beads on a clean filter paper and allow to dry. Examine the beads for dulling under 60 power magnification.

4.0 SAMPLING AND TESTING.

4.1 The manufacturer shall furnish the engineer free access to all parts of the plant and shall furnish every reasonable facility for inspection.

4.2 The engineer reserves the right to sample at the point of manufacture, at intermediate points of storage, or at destination. The engineer will determine the location and frequency of sampling.

5.0 CERTIFICATION AND ACCEPTANCE.

5.1 The manufacturer shall furnish to the engineer, at destination, prior to approval and use of any material delivered, a certification in triplicate as shown in this specification for each shipment, certifying that the beads conform to all requirements of these specifications. The certification shall include or have attached specific results of tests performed for Roundness, Refractive Index, Flow Properties, and Gradation. The certifications shall also show the purchase order number, destination, quantity, date shipped, and the lot number.

5.2 Acceptance of the beads will be based on the manufacturer's certification and upon the results of such tests as may be performed by the engineer.

6.0 PACKAGING AND MARKING.

6.1 Beads shall be furnished in 2000 pound bulk cartons or 2400 pound bulk bags as specified in the bid request.

6.2 Bulk Cartons. The bulk cartons shall meet the requirements of Federal Specifications PPP-B-640d, Class II for Boxes, Fiberboard, Corrugated, Triple-wall with a minimum 4 mil. thick plastic bag liner.

6.2.1 The cartons shall be approximately 40 inches square by 29 inches high, shipped on a double faced reusable-type pallet approximately 40 x 42 inches in size.

6.2.2 The cartons shall have two horizontal steel bands and one vertical steel band, each at least 1/2 inch wide and tightened sufficiently to allow double deck storage and to keep the carton from deforming during shipment.

6.3 Bulk Bags. The bulk bags shall meet the requirements of Section 16.1 of the United Nations Recommendations on the Transport of Dangerous Goods, Sixth Edition (ST/SG/AC.10/1/Rev.). The loading for the "Top Lifting Test" shall be modified to require a mass 5 times the maximum possible load.

6.3.1 The bags shall be approximately 43 x 43 x 26 inches, with four interior baffles and constructed as follows:.

a. The bags shall be constructed of 6 1/2 ounce coated sift proof polypropylene fabric,

b. The bags shall be constructed with a coated sift proof fabric remote opening that can be controlled by a person standing to one side of the bag

c. The bag shall have four top-lift loops sized to allow lifting from a central hook when the bag is full.

6.3.2 Bags shall be shipped on a double-faced, reusable pallet approximately 42 x 42 inches, topped with a double-faced, type B fluted, 42 inch x 42 inch by 1/8 inch thick, 200-pound test, cardboard sheet. The assembled bag and pallets shall be stackable two high.

6.3.3 Each bag shall be strapped or banded to the pallet with a minimum of three nylon or polypropylene straps. Two straps shall be vertically positioned at 90 degrees to each other. The third strap shall be centrally positioned horizontally to the pallet.

6.4 Each container shall be shrink or stretch wrapped with plastic on the top and sides, so that the contents will completely shed water.

6.5 Each container shall be marked with the name and type of contents, manufacturer of the beads, net weight, and lot designation.

7.0 ORDERING INFORMATION. Beads are to be ordered as Type I Free Flow Glass Beads or Type I Moisture Resistant Glass Beads. The type of packaging is to be shown in the bid request as "Bulk Cartons" or "Bulk Bags".

8.0 CERTIFICATION STATEMENT. THE FOLLOWING FORM IS TO BE COMPLETED, SIGNED AND SUBMITTED IN TRIPLICATE WITH EACH SHIPMENT OF GLASS BEADS, HOWEVER, MORE THAN ONE SHIPMENT MAY BE SHOWN ON A SINGLE CERTIFICATION SO LONG AS TEST RESULTS ARE INCLUDED FOR EACH LOT:

We hereby certify that Glass Beads described below comply with all requirements of the Missouri Department of Transportation's specifications in Bid Request No. _____.

The following glass beads were manufactured by _____

at _____ and are covered by this certification.

TYPE OF BEAD: ☐ Type I Free Flow ☐ Type I Moisture Resistant

Purchase Order		Destination	Quantity (Pounds)	Lot Number	Date Shipped
	No. 1				
	No. 2				
	No. 3				

Following specific results of tests performed on these glass beads:

	Destination No. 1	Destination No. 2	Destination No. 3
Type	_____	_____	_____
Lot No.:	_____	_____	_____
Roundness	_____	_____	_____
Refractive Index:	_____	_____	_____
Flow Properties	_____	_____	_____
Gradation:			
Percent Passing No. 20	_____	_____	_____
Percent Passing No. 30	_____	_____	_____
Percent Passing No. 50	_____	_____	_____
Percent Passing No.100	_____	_____	_____

Certified By: _____

Title:_____

Date: _____